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USACE / NAVFAC / AFCESA **UFGS-L-15400N (August 2003)**

Preparing Activity: NAVFAC **Superseding UFGS-L-15400N (February 2003)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

Use for LANTNAVFACENGCOM projects only

Revised throughout - Format changes and reference dates not indicated by CHG tags. Other revisions are indicated by CHG tags.
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SECTION 15400N

PLUMBING SYSTEMS
08/03

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NOTE: This guide specification covers the requirements for plumbing systems including plumbing fixtures, equipment, and piping which is located within, on, under, and adjacent to buildings. Plumbing system requirements must conform to NAVFAC (Unified Facilities) Design Manual 3.01, "Plumbing Systems," Federal Standard FED-STD-795, "Uniform Federal Accessibility Standards (UFAS)," Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities, and Department of Defense (DoD) adopted and approved Plumbing Code (ICC IPC) which is required by Military Handbook MIL-HDBK-1190, "Facility Planning and Design Guide."

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Use of electronic communication is encouraged.

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NOTE: Following information shall be shown on project drawings:

1. Only drawings (not specifications) shall indicate capacity, efficiency, dimensions, details, plan view, sections, elevations, and locations of fixtures and equipment; space required to replace strainers, filters, and for maintenance of equipment.

2. Show location of wye strainer on building side of water supply valve in each building; indicate wye strainer blow-off outlet with piping to adjacent exterior wall hydrant. Note: This will clean the strainer each time the wall hydrant is used.

3. Show configuration, slope, and location of each piping system such as: above or below floors, above or below ceilings, above or below roofs, above or below ground.

4. Show location of each sectionalizing valve in each water system. Sectionalizing valves should be ball valves.

5. Show location of each solenoid-operated flush valve and solenoid-operated lavatory faucet on project drawings.

6. The following items will meet this specification:

Plastic Bathtub/Shower Units (Note: Sterling Model No. OC-AP-TS-ADVANTAGE)

Plastic Bathtubs (Note: Sterling Model No. OC-15-60-ADVANTAGE)

Plastic Shower Stalls (Note: Sterling Model No. V-36-HG-VIKRELL-Image)

Plastic Bathtub Liners (Note: American Bathtub Liners, Inc.)

Plastic Bathtub Wall Surrounds (Note: Sterling Model No. OC-TWS)

Bathtubs (Note: Kohler Model No. K-519/K-520; and Eljer Model No. 012-1520/012-1525).

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PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI A40	(1993) Safety Requirements for Plumbing
ANSI A112.21.2M	(1983) Roof Drains
ANSI A112.36.2M	(1991; R 2002) Cleanouts
ANSI B16.18	(2001) Cast Copper Alloy Solder Joint Pressure Fittings
ANSI Z21.10.1	(2001) Gas Water Heaters Volume I Storage Water Heaters with Input Ratings of 75,000 Btu per Hour or Less
ANSI Z21.22	(1999) Relief Valves and Automatic Gas

	Shutoff Devices for Hot Water Supply Systems

AIR-CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

ARI 1010	(1994) Drinking-Fountains and Self-Contained, Mechanically-Refrigerated Drinking-Water Coolers

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME A112.6.1M	(1997) Supports for the Off-the-Floor Plumbing Fixtures for Public Use
ASME A112.6.3M	(2001) Floor Drains and Trench Drains
ASME A112.18.1	(2000) Plumbing Fixture Fittings
ASME A112.19.1M	(1994; R 1999) Enameled Cast Iron Plumbing Fixtures
ASME A112.19.2M	(1998) Vitreous China Plumbing Fixtures
ASME A112.19.3M	(2000) Stainless Steel Plumbing Fixtures (Designed for Residential Use)
ASME A112.19.4M	(1994; Errata 1996) Porcelain Enameled Formed Steel Plumbing Fixtures
ASME A112.19.5	(1999) Trim for Water-Closet Bowels, Tanks, and Urnials
ANSI/ASME B16.3	(1998) Malleable Iron Threaded Fittings
ASME/ANSI B16.22	(2001) Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
ASME/ANSI B16.39	(1998) Malleable Iron Threaded Pipe Unions Classes 150, 250, and 300

AMERICAN SOCIETY OF SANITARY ENGINEERING (ASSE)

ASSE 1003	(2001; Errata 2003) Water Pressure Reducing Valves
ASSE 1014	(1989) Performance Requirements for Hand-Held Showers
ASSE 1019	(1997) Vacuum Breaker Wall Hydrants, Freeze Resistant Automatic Draining

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53/A 53M	(2002) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
ASTM A 518/A 518M	(1999) Corrosion-Resistant High-Silicon Iron Castings

ASTM B 32	(2000; Errata 2002) Solder Metal
ASTM B 42	(2002) Seamless Copper Pipe, Standard Sizes
ASTM B 88M	(1999) Seamless Copper Water Tube (Metric)
ASTM B 88	(2002) Seamless Copper Water Tube
ASTM B 584	(2000) Standard Specification for Copper Alloy Sand Castings for General Applications
ASTM D 2665	(2002; Rev A) Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings
ASTM D 2846/D 2846M	(1999) Chlorinated Poly(Vinyl Chloride) (CPVC) Plastic Hot- and Cold-Water Distribution Systems

AMERICAN WATER WORKS ASSOCIATION (AWWA)

AWWA C651	(1999) Disinfecting Water Mains
AWWA C701	(2002) Cold-Water Meters - Turbine Type, for Customer Service

CAST IRON SOIL PIPE INSTITUTE (CISPI)

CISPI 301	(1997) Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications
CISPI 310	(1997) Couplings Joint for Use in Connection with Hubless Cast Iron Soil Pipe and Fitting

FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (FCCCHR)

FCCCHR-USC	(2001) List of Approved Backflow Prevention Assemblies

INTERNATIONAL ASSOCIATION OF PLUMBING AND MECHANICAL OFFICALS

IAPMO Z124.1	(1995) Plastic Bathtub Units
IAPMO Z124.2	(1995) Plastic Shower Receptors and Shower Stalls
IAPMO Z124.8	(1990) Plastic Bathtub Liners

INTERNATIONAL CODE COUNCIL (ICC)

ICC Plumbing Code	(2000) International Plumbing Code (IPC)

INDUSTRIAL SAFETY EQUIPMENT ASSOCIATION

ISEA Z358.1	(1998) Emergency Eyewash and Shower

Equipment

MANUFACTURERS STANDARDIZATION SOCIETY OF THE VALVE AND FITTINGSINDUSTRY, INC. (MSS)

MSS SP-58	(2002) Pipe Hangers and Supports - Materials, Design and Manufacture
MSS SP-69	(2002) Pipe Hangers and Supports - Selection and Application
MSS SP-70	(1998) Cast Iron Gate Valves, Flanged and Threaded Ends
MSS SP-71	(1997) Cast Iron Swing Check Valves, Flanged and Threaded Ends
MSS SP-80	(1997) Bronze Gate, Globe, Angle and Check Valves
MSS SP-85	(2002) Cast Iron Globe & Angle Valves Flanged and Threaded Ends

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250	(1997) Enclosures for Electrical Equipment (1000 Volts Maximum)

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 54	(2002) National Fuel Gas Code
NFPA 211	(2000) Chimneys, Fireplaces, Vents, and Solid Fuel Burning Appliances

PLUMBING AND DRAINAGE INSTITUTE (PDI)

PDI G 101	(1985) Testing and Rating Procedure for Grease Interceptors
PDI WH 201	(1992) Water Hammer Arrestors

UNDERWRITERS LABORATORIES INC. (UL)

UL 174	(1996; Rev thru Oct 1999) Household Electric Storage Tank Water Heaters
UL 250	(1993; R 2000) Household Refrigerators and Freezers
UL 430	(1994; R 2001) Waste Disposers
UL 499	(1997; R 2002) Electric Heating Appliances
UL 749	(1997; Rev thru Feb 1999) Household Dishwashers

1.2 SYSTEM DESCRIPTION

Provide [new and modify existing] plumbing systems, complete and ready for operation. Plumbing systems including plumbing fixtures, equipment, and piping which is located within, on, under, and adjacent to buildings, shall be in accordance with the required and advisory provisions of the Plumbing Code (ICC Plumbing Code). Plumbing systems include piping less than 1.50 meters 5 feet outside of building walls. [Plumbing systems also include piping beyond 1.50 meters 5 feet outside of building walls including connections to existing exterior distribution piping systems].

1.3 SUBMITTALS

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NOTE: Where a "G" in submittal tags follows a submittal item, it indicates Government approval for that item. Add "G" in submittal tags following any added or existing submittal items deemed sufficiently critical, complex, or aesthetically significant to merit approval by the Government. Submittal items not designated with a "G" will be approved by the QC organization.
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**NOTE: For Marine Air Corps Station, New River, and Camp LeJeune NC,
Add the following submittal requirement for shower faucets.**
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Submit the following in accordance with Section 01330, "Submittal Procedures."

SD-03 Product Data

Flush valve water closets

Flush valve urinals

Flush tank water closets

Wall hung lavatories

Countertop lavatories

Kitchen sinks

Service sinks

Drinking-water coolers; G

Plastic bathtubs

Plastic shower stalls

Plastic bathtub liners

Plastic bathtub wall surrounds

Water heaters; G

Pumps; G

Backflow prevention assemblies; G

[Shower Faucets; G]

SD-10 Operation and Maintenance Data

Water heaters, Data Package 2

Drinking-water coolers, Data Package 2

Submit in accordance with Section 01781, "Operation and Maintenance Data."

PART 2 PRODUCTS

2.1 PLUMBING FIXTURES

2.1.1 Flush Valve Water Closets

ASME A112.19.2M, white vitreous china, siphon jet, elongated bowl, floor-mounted, floor outlet. Top of toilet seat height above floor shall be 356 to 381 mm 14 to 15 inches, except 432 to 483 mm 17 to 19 inches for wheelchair water closets. Provide wax bowl ring including plastic sleeve. Water flushing volume of the water closet and flush valve combination shall not exceed 6.1 liters 1.6 gallons per flush. Provide white solid plastic elongated [open-front seat] [closed-front seat with cover]. Provide large diameter flush valve including angle control-stop valve, vacuum breaker, tail pieces, slip nuts, and wall plates; exposed to view components shall be chromium-plated or polished stainless steel. Flush valves shall be nonhold-open type. Mount flush valves not less than 279 mm 11 inches above the fixture. [Provide piston type, oil operated, flush valve and wall support for salt water service.]

[Provide solenoid-activated flush valves including electrical-operated light-beam-sensor to energize the solenoid.]

2.1.2 Flush Valve Urinals

ASME A112.19.2M, white vitreous china, wall-mounted, wall outlet, siphon jet, integral trap, and extended side shields. Provide urinal with the rim 432 mm 17 inches above the floor. Water flushing volume of the urinal and flush valve combination shall not exceed 3.8 liters 1.0 gallons per flush. Provide ASME A112.6.1M concealed chair carriers with vertical steel pipe supports. Provide large diameter flush valve including angle control-stop valve, vacuum breaker, tail pieces, slip nuts, and wall plates; exposed to view components shall be chromium-plated or polished stainless steel. Flush valves shall be nonhold-open type. Mount flush valves not less than 279 mm 11 inches above the fixture. [Provide piston type, oil operated, flush valve and wall support for salt water service.]

[Provide solenoid-activated flush valves including electrical-operated light-beam-sensor to energize the solenoid.]

2.1.3 Wheelchair Flush Valve Type Urinals

ASME A112.19.2M, white vitreous china, wall-mounted, wall outlet, blowout

action, integral trap, elongated projecting bowl, 508 mm 20 inches long from wall to front of flare, and ASME A112.19.5 trim. Provide large diaphragm (not less than 66 mm 2.625 inches upper chamber inside diameter at the point where the diaphragm is sealed between the upper and lower chambers), nonhold-open flush valve of chrome plated cast brass conforming to ASTM B 584, including vacuum breaker and angle (control-stop) valve with back check. The water flushing volume of the flush valve and urinal combination shall not exceed 3.8 liters one gallon per flush. Furnish urinal manufacturer's certification of conformance. Provide ASME A112.6.1M concealed chair carriers. Mount urinal with front rim a maximum of 432 mm 17 inches above floor and flush valve handle a maximum of 1118 mm 44 inches above floor for use by handicapped on wheelchair.

2.1.4 Flush Tank Water Closets

ASME A112.19.2M, white vitreous china, siphon jet, round bowl, pressure assisted, floor-mounted, floor outlet. Top of toilet seat height above floor shall be 356 to 381 mm 14 to 15 inches, except 432 to 483 mm 17 to 19 inches for wheelchair water closets. [Nonfloat swing type flush tank valves are not acceptable.] Provide wax bowl ring including plastic sleeve. Water flushing volume of the water closet shall not exceed 6.1 liters 1.6 gallons per flush. Provide white solid plastic round closed-front seat with cover.

2.1.5 Wall Hung Lavatories

ASME A112.19.2M, white vitreous china, straight back type, minimum dimensions of 483 mm 19 inches, wide by 432 mm 17 inches front to rear, with supply openings for use with top mounted centerset faucets, and openings for concealed arm carrier installation. Provide ASME A112.6.1M concealed chair carriers with vertical steel pipe supports and concealed arms for the lavatory. Mount lavatory with the front rim 864 mm 34 inches above floor and with 737 mm 29 inches minimum clearance from bottom of the front rim to floor. [Provide top mounted washerless centerset lavatory faucets.]

[Provide top-mounted solenoid-activated lavatory faucets including electrical-operated light-beam-sensor to energize the solenoid.]

2.1.6 Countertop Lavatories

ASME A112.19.2M, white vitreous china, self-rimming, minimum dimensions of 483 mm 19 inches wide by 432 mm 17 inches front to rear, with supply openings for use with top mounted centerset faucets. Furnish template and mounting kit by lavatory manufacturer. Mount counter with the top surface 864 mm 34 inches above floor and with 737 mm 29 inches minimum clearance from bottom of the counter face to floor. [Provide top mounted washerless centerset lavatory faucets.]

[Provide top-mounted solenoid-activated lavatory faucets including electrical-operated light-beam-sensor to energize the solenoid.]

2.1.7 Kitchen Sinks

ASME A112.19.3M, 20 gage stainless steel with integral mounting rim for flush installation, minimum dimensions of 838 mm 33 inches wide by 533 mm 21 inches front to rear, two compartments, with undersides fully sound deadened, with supply openings for use with top mounted washerless sink faucets with hose spray, and with 89 mm 3.5 inch drain outlet. Provide

stainless steel drain outlets and stainless steel cup strainers. Provide separate 38 mm 1.5 inch P-trap and drain piping to vertical vent piping from each compartment. Provide top mounted washerless sink faucets with hose spray. [Provide UL 430 waste disposer in right compartment.]

2.1.8 Service Sinks

ASME A112.19.2M, white vitreous china with integral back and wall hanger supports, minimum dimensions of 559 mm 22 inches wide by 508 mm 20 inches front to rear, with two supply openings in 254 mm 10 inch high back. Provide floor supported wall outlet cast iron P-trap and stainless steel rim guards as recommended by service sink manufacturer. Provide back mounted washerless service sink faucets with vacuum breaker and 19 mm 0.75 inch external hose threads.

2.1.9 Drinking-Water Coolers

ARI 1010 with more than a single thickness of metal between the potable water and the refrigerant in the heat exchanger, wall-hung, bubbler style, air-cooled condensing unit, 5 ml per second 4.75 gph minimum capacity, stainless steel splash receptor and basin, and stainless steel cabinet. Bubblers shall be controlled by push levers or push bars, front mounted or side mounted near the front edge of the cabinet. Bubbler spouts shall be mounted at maximum of 914 mm 36 inches above floor and at front of unit basin. Spouts shall direct water flow at least 102 mm 4 inches above unit basin and trajectory parallel or nearly parallel to the front of unit. Provide ASME A112.6.1M concealed steel pipe chair carriers.

2.1.10 Wheelchair Drinking Water cooler

ARI 1010, wall-mounted bubbler style with ASME A112.6.1M concealed chair carier, air-cooled condensing unit, 5 mL per second 4.75 gph minimum capacity, stainless steel splash receptor, and all stainless steel cabinet, with 686 mm 27 inch minimum knee clearance from front bottom of unit to floor and 914 mm 36 inch maximum spout height above floor. Bubblers shall also be controlled by push levers, by push bars, or touch pads one on each side or one on front and both sides of the cabinet.

2.1.11 Plastic Bathtub/Shower Units

IAPMO Z124.1 four piece white solid acrylic pressure molded fiberglass reinforced plastic bathtub/shower units. Units shall be scratch resistant, waterproof, and reinforced. Provide recessed type units approximately 1524 mm 60 inches wide, 762 mm 30 inches front to rear, 1829 mm 72 inches high with 381 mm 15 inches high rim for through-the-floor drain installation with unit bottom or feet firmly supported by a smooth level floor. Provide left or right drain outlet units as required. Units shall have built-in soap dish and minimum of 305 mm 12 inch long stainless steel horizontal grab bar located on back wall for standing use. Units shall meet performance requirements of IAPMO Z124.1 and shall be labeled by NAHB Research Foundation, Inc. for compliance. Install unit in accordance with the manufacturer's written instructions. Finish installation by covering unit attachment flanges with wall board in accordance with unit manufacturer's recommendation. Provide smooth 100 percent silicone rubber white bathtub calk between the unit and the adjacent walls and floor surfaces.

2.1.12 Plastic Bathtubs

IAPMO Z124.1 one piece white solid acrylic pressure molded fiberglass reinforced plastic bathtubs. Bathtubs shall be scratch resistant, waterproof, and reinforced. Provide recessed type bathtubs approximately 1524 mm 60 inches wide, 762 mm 30 inches front to rear, 381 mm 15 inches high rim for through-the-floor drain installation with bathtub bottom or feet firmly supported by a smooth level floor. Provide left or right drain outlet bathtub as required. Bathtubs shall meet performance requirements of IAPMO Z124.1 and shall be labeled by NAHB Research Foundation, Inc. for compliance. Install bathtub in accordance with the manufacturer's written instructions. Finish installation by covering bathtub attachment flanges with dry-wall in accordance with bathtub manufacturer's recommendation. Provide smooth 100 percent silicone rubber white bathtub calk between the bathtub and the adjacent walls and floor surfaces.

2.1.13 Plastic Shower Stalls

IAPMO Z124.2 four piece white solid acrylic pressure molded fiberglass reinforced plastic shower stalls. Shower stalls shall be scratch resistant, waterproof, and reinforced. Provide recessed type shower stalls approximately 914 mm 36 inches wide, 914 mm 36 inches front to rear, 1829 mm 76 inches high, and 125 high mm 5 inch high curb with shower stall bottom or feet firmly supported by a smooth level floor. Provide PVC shower floor drains and stainless steel strainers. Shower stalls shall meet performance requirements of IAPMO Z124.2 and shall be labeled by NAHB Research Foundation, Inc. for compliance. Install shower stall in accordance with the manufacturer's written instructions. Finish installation by covering shower stall attachment flanges with dry-wall in accordance with shower stall manufacturer's recommendation. Provide smooth 100 percent silicone rubber white bathtub calk between the top, sides, and bottom of shower stalls and bathroom walls and floors.

2.1.14 Plastic Bathtub Liners

IAPMO Z124.8 one piece white plastic bathtub liners. Existing bathtubs shall be identified and measured to insure proper identification in order that each new bathtub liner shall be custom molded to fit the exact contours of the existing bathtubs. Provide left or right drain outlet bathtub liners as required. Bathtub liners shall be inserted over and into the existing bathtubs without disturbing the existing ceramic tile wainscot walls and existing floor material. Prepare the existing cast-iron bathtubs, ceramic tile wainscots, and floor to receive the new bathtub liners in accordance with the bathtub liner manufacturer's written instructions. Installation personnel shall be trained by the bathtub liner manufacturer. Seal the bathtub liner to existing bathtub with waterproof adhesive as required to keep moisture out from behind the bathtub liner. Provide smooth white waterproof bathtub sealant between bathtub drains, bathtub, and bathtub liners. Provide replacement chromium-plated overflow cover plates and push-pull bathtub drain stopper assembly. Provide smooth 100 percent silicone rubber white bathtub calk between the bathtub liner and the adjacent walls and floor surfaces in accordance with the bathtub liners manufacturer's written instructions.

2.1.15 Plastic Bathtub Wall Surrounds

IAPMO Z124.1 three piece white sectional pressure molded fiberglass plastic bathtub wall surrounds suitable for installation with existing bathtubs which are approximately 1524 mm 60 inches wide by 762 mm 30 inches front to rear. Wall surrounds shall have built-in soap dish and minimum of 305 mm 12 inch long stainless steel horizontal grab bar located on back wall for

standing use. Bathtub wall surrounds shall meet performance requirements of IAPMO Z124.1 and shall be labeled by NAHB Research Foundation, Inc. for compliance. Install bathtub wall surrounds in accordance with the manufacturers written instructions. Finish installation by covering bathtub wall surround attachment flanges with dry-wall in accordance with bathtub wall surround manufacturer's recommendations. Provide smooth 100 percent silicone rubber white bathtub calk between the bathtubs and the adjacent walls and floor surfaces.

2.1.16 Precast Terrazzo Shower Floors

Terrazzo shall be made of marble chips cast in white portland cement to produce 25 mPa 3000 psi minimum compressive strength 7 days after casting. Provide floor or wall outlet copper alloy body drain cast integral with terrazzo, with polished stainless steel strainers.

2.1.17 Precast Terrazzo Mop Sinks

Terrazzo shall be made of marble chips cast in white portland cement to produce 25 mPa 3000 psi minimum compressive strength 7 days after casting. Provide floor or wall outlet copper alloy body drain cast integral with terrazzo, with polished stainless steel strainers.

2.1.18 Bathtubs, Cast Iron

ASME A112.19.1M, white enameled cast iron, recessed type, minimum dimensions of 1524 mm 60 inches wide by 762 mm 30 inches front to rear by 406 mm 16 inches high with drain outlet for above-the-floor drain installation. Provide left or right drain outlet bathtub as indicated.

2.1.19 Bathtubs, Porcelain

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NOTE: This tub is a single source product. Do not use alone but as an option in concurrence with cast iron type above. Do not use enamel type tubs.

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ASME A112.19.4M, white porcelain bonded to enameling grade metal, bonded to a structural composite, recessed type, minimum dimensions of 1524 mm 60 inches wide by 762 mm 30 inches front to rear by 406 mm 16 inches high with drain outlet for above-the-floor drain installation. Provide left or right drain outlet bathtub as indicated.

2.1.20 Emergency Eyewash and Shower

ISEA Z358.1, floor supported free standing unit. Provide deluge shower head, stay-open ball valve operated by pull rod and ring or triangular handle. Provide eyewash and stay-open ball valve operated by foot treadle or push handle.

2.1.21 Emergency Eye and Face Wash

ISEA Z358.1, wall-mounted self-cleaning, nonclogging eye and face wash with quick opening, full-flow valves, stainless steel eye and face wash receptor. Unit shall deliver 0.19 L/s 3 gpm of aerated water at 207 kPa (gage) 30 psig flow pressure, with eye and face wash nozzles 838 to 1143 mm 33 to 45 inches above finished floor. Provide copper alloy control valves. Provide an air-gap with the lowest potable eye and face wash water outlet

located above the overflow rim by not less than the International Plumbing Code minimum. [Provide a pressure-compensated tempering valve, with leaving water temperature setpoint adjustable throughout the range 15.5 to 35 degrees C 60 to 95 degrees F.]

2.2 FIXTURE FAUCETS AND ACCESSORIES

ASME A112.18.1 for plumbing fixture faucets. The finish of plumbing fixture faucets and accessories exposed to view shall be chromium-plated or polished stainless steel except as modified herein. Handles may be clear plastic. Bolts, nuts, and screws shall be copper alloy or stainless steel. Provide globe valves or angle valves, and union connections in each supply to each faucet; chromium-plated finish is not required. Faucets shall be washerless type and shall have threaded type end connections, coupling nuts, or union connections. Faucets may be of the single control type. Provide washers and locknuts to secure faucets to lavatories and sinks.

2.2.1 Lavatory Faucets

Provide washerless faucets including aerators. Faucet handles shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist; maximum force required to operate faucet handles shall be 22 newtons 5 pounds of force. Faucets for indicated wheelchair lavatories shall have gooseneck spout with aerator minimum of 125 mm 5 inches above rim and shall have handles which open within one-quarter turn in opposite directions. Provide faucets which delever a maximun of 2.0 GPM at 60 PSI0.126 l/s at 414 kPa per Energy Star requirements.

2.2.2 Lavatory Drain Outlets

Provide drain outlets and drain tail pieces for each lavatory. Provide perforated grid strainers for each lavatory[, except provide pop-up drains and push-pull knob above centerset faucets for each lavatory in bedrooms or in bathrooms adjacent to bedrooms].

2.2.3 Traps

Provide P-trap for each plumbing fixture which does not have integral trap. Provide 40 mm 1.5 inch white PVC adjustable P-traps and tubing with slip nuts and gaskets; chromium-plated finish is not required. Provide separate 40 mm 1.5 inch P-trap and drain piping to vertical vent piping from each lavatory and sink compartment.

2.2.4 Wheelchair Valve and Tap Guard

Provide wheelchair lavatory and kitchen sink with trap and angle valve guard wrap. Provide factory assembled; white; pre-mold; antimicrobial. Provide wrap material of molded closed cell vinyl. Valves shall be serviceable without removal of guard wrap.

2.2.5 Sink Faucets

Provide top mounted washerless faucets including swing spouts, aerators and hose spray.

2.2.6 Shower Faucets

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NOTE: For Marine Air Corps Station, New River, and

Camp LeJeune NC, use ball type control handles, not lever type control handle, when handicap accessibility is not required for the faucets

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Provide single control pressure equalizing shower faucets with body mounted from behind the wall with threaded connections. Provide ball joint self-cleaning shower heads. Provide shower heads which delever a maximun of 2.2 GPM at 80 PSI0.139 l/s at 551 kPa per Energy Star requirements. Provide tubing mounted behind the wall between shower faucets and shower heads. Provide globe valves or angle valves with union connections in each supply to faucet. [Provide shower valve with ball type control handle.]

2.2.7 Hand-Held Shower Head

ASSE 1014, [fixed] [adjustable] spray hand-held shower head with swivel fitting, [pushbutton flow control,] 1524 mm 60 inch minimum flexible [chrome plated copper alloy] [polished stainless steel] hose and in-line vacuum breaker [wall bracket to mount hand spray] [635 mm 25 inch] [_____] grab bar with sliding spray holder that locks at any height to allow the use of the unit as either a hand-held spray or a fixed shower head. Provide shower heads which delever a maximun of 2.2 GPM at 80 PSI0.139 l/s at 551 kPa per Energy Star requirements.

2.2.8 Bathtub and Shower Faucets and Drain Fittings

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NOTE: For Marine Air Corps Station, New River, and Camp LeJeune NC, use ball type control handles, not lever type control handle, when handicap accessibility is not required for the faucets

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Provide single control pressure equalizing bathtub and shower faucets with body mounted from behind the wall with threaded connections. Provide ball joint self-cleaning shower heads. Provide shower heads which delever a maximun of 2.2 GPM at 80 PSI0.139 l/s at 551 kPa per Energy Star requirements. Provide tubing mounted from behind the wall between bathtub faucets and shower heads and bathtub diverter spouts. Provide separate globe valves or angle valves with union connections in each supply to faucet. Provide trip-lever pop-up drain fittings for above-the-floor drain installations. The top of drain pop-ups, drain outlets, tub overflow outlet, and; control handle for pop-up drain shall be chromium-plated or polished stainless steel. Linkage between drain pop-up and pop-up control handle at bathtub overflow outlet shall be copper alloy or stainless steel. Provide 40 mm 1.5 inch copper alloy adjustable tubing with slip nuts and gaskets between bathtub overflow and drain outlet; chromium-plated finish is not required. [Provide bathtub and shower valve with ball type control handle.]

2.2.9 Service Sink and Mop Sink Faucets

Provide copper alloy back or wall mounted faucets with vacuum breaker and 20 mm 0.75 inch external hose threads.

2.2.10 Washing Machine Boxes

Provide recessed PVC plastic wall box including 50 mm 2 inch drain outlet and single lever hot water and cold water ball valves with 19 mm 0.75 inch

external hose threads. Provide 50 mm 2 inch drain outlet approximately 1050 mm 42 inches above floor. Provide two 1524 mm 60 inch long flexible braided stainless steel high-pressure washing machine hoses and 19 mm 0.75 inch female hose fittings on each end.

2.2.11 Ice Maker Boxes

Provide recessed PVC plastic wall box including ball valve with connections for each refrigerator.

2.3 EQUIPMENT

2.3.1 Water Heaters (Electric)

UL 174, electric water heaters with double heating element, glass-lined steel tanks, high efficiency type insulated with polyurethane foam insulation, replaceable anodes, with adjustable range thermostat to allow hot water settings between 43 and 71 degrees C 110 and 160 degrees F. Provide ANSI Z21.22 combination pressure and temperature relief valve, copper alloy body, automatic reseating, test lever, and discharge capacity based on AGA temperature steam rating. Provide plastic lined threaded steel dielectric pipe nipple at the water inlet connection and at the water outlet connection.

2.3.2 Water Heaters (Gas Fired)

ANSI Z21.10.1, gas-fired water heaters, glass-lined steel tanks, high efficiency type insulated with polyurethane foam insulation, replaceable anodes, with adjustable range thermostat to allow hot water settings between 43 and 71 degrees C 110 and 160 degrees F. Provide ANSI Z21.22 combination pressure and temperature relief valve, copper alloy body, automatic reseating, test lever, and discharge capacity based on AGA temperature steam rating. Provide plastic lined threaded copper or steel dielectric pipe nipple at the water inlet connection and at the water outlet connection.

2.3.2.1 Gas Vents

NFPA 211, Type B, of the prefabricated multi-wall UL listed type.

2.3.2.2 Gas Piping System

NFPA 54. Provide ASTM A 53/A 53M, Schedule 40 steel pipe, ANSI/ASME B16.3 threaded fittings, and ASME/ANSI B16.39 threaded unions.

2.3.2.3 Gas Valves

Provide cast-iron or bronze body valves, with bronze plug or ball and two position lever handles. Valves shall be suitable for 860 kPa-gage 125 psig working pressure. UL listed ball valves may be provided in lieu of plug valves.

2.3.3 Water Heaters (Steam Heated)

Provide cement- or glass-lined vertical steel domestic water storage tanks, minimum of 860 kPa-gage 125 psig working pressure. Heater shall raise the temperature of a continuous flow of water from 4 to 82 degrees C 40 to 180 degrees F. Provide double wall copper tube domestic water heating elements constructed with air gap to atmosphere between the two walls using steam as

the heating medium exterior of the heating elements. Provide copper alloy or cast-iron water temperature regulating valves with adjustable range thermostat to allow hot water settings between 43 and 82 degrees C 110 and 180 degrees F.

2.3.4 Electric Instantaneous Water Heaters

UL 499 and UL listed flow switch activated, tankless electric instantaneous water heater for wall mounting below sink or lavatory.

2.3.5 Pumps

The operating point on the characteristic performance curve for the impeller size of each pump shall be to the left (shut-off side) of and not more than 5 percent below the point of maximum efficiency for the impeller.

2.3.5.1 Inline Water Pumps

Provide factory assembled and tested inline water pumps constructed of materials suitable for hot domestic water service.

2.3.5.2 Base-Mounted Water Pumps

Provide factory assembled and tested base-mounted water pumps constructed of materials suitable for hot domestic water service. Provide general service, mechanical seals, and drip-proof electric motors.

2.3.5.3 Submersible Sump Pumps

Provide factory assembled and tested submersible sump pumps for operation under water. Pump shall be complete with cast-iron casing, bronze impeller, stainless steel shaft, sealed heavy-duty ball bearings, water-cooled hermetically-sealed motor, built-in automatic reset thermal protection, float switches, and waterproof three-conductor cables and grounding plugs. Provide high water alarm and check valve.

2.3.5.4 Sewage Pumps

Provide single type duplex type with automatic controls to alternate the operation from one pump to the other pump and to start the second pump in the event the first pump cannot handle the incoming flow. Provide high water alarm and check valve.

2.3.6 Dishwashers

UL 749 and UL listed under counter type with instantaneous water heater, 2 levels of wash racks, lift out utensil holder, and detergent dispenser. Automatic controls shall cycle through the Wash, Rinse, Dry/Heat, and Stop phases and shall be capable of manual setting to repeat or skip any phase.

2.3.7 Refrigerators

UL 250 and UL listed, 2 door, top freezer type, with adjustable shelves, separate refrigerator and freezer temperature controls, energy savings switch, separate meat tender and vegetable crispers, and separate compartments for eggs and spreads. Provide 0.453 cu. meters 16 cu. ft. frost-free refrigerators with automatic ice makers and mounted on 4 rollers.

2.3.8 Air Compressors

Provide manufacturer's standard single packaged factory assembled shop air compressor designed for 860 kPa-gage `125 psig working pressure. Provide compressed air piping as specified for copper domestic water piping.

2.4 DRAIN, WASTE, AND VENT (DWV) PIPE AND FITTINGS

Fittings shall be long radius fittings, except fittings in vent piping may be short radius fittings. Minimum size piping shall be 50 mm 2 inches for buried piping and 40 mm 1.5 inches for aboveground piping.

2.4.1 Buried Piping

2.4.1.1 Cast-Iron Hubless Pipe and Fittings

CISPI 301 with CISPI 310 couplings or Plumbing Code approved or listed couplings.

2.4.1.2 Polyvinyl Chloride (PVC) System

ASTM D 2665, plastic pipe, fittings, and solvent cement.

2.4.2 Aboveground Piping

2.4.2.1 Cast-Iron Hubless Pipe and Fittings

CISPI 301 with CISPI 310 couplings or Plumbing Code approved or listed couplings.

2.4.2.2 Polyvinyl Chloride (PVC) System

ASTM D 2665, plastic pipe, fittings, and solvent cement; do not use aboveground in more than two-story buildings.

2.4.3 Cleanouts

ANSI A112.36.2M; provide threaded PVC plastic cleanout plugs.

2.4.3.1 Floor Cleanouts

Provide cast-iron or ductile-iron floor cleanout with anchor flange, adjustable height polished bronze, stainless steel, or chromium-plated copper alloy rim and scoriated floor plate with "CO" cast in the plate, and countersunk screws for installing floor plate flush with finished floor.

2.4.3.2 Wall Cleanouts

Provide polished stainless steel or chromium-plated copper alloy cover plate and secure to cleanout plug with countersunk stainless steel screw.

2.4.3.3 Cleanouts Exterior to Buildings

Provide cast-iron or PVC plastic cleanouts. Provide cleanouts flush with finished grade or concrete slab.

2.4.4 Drains

ASME A112.6.3M; provide cast-iron or ductile-iron drains and clamping rings for use with membrane waterproofing. Provide P-traps for each floor drain.

2.4.4.1 Flush Strainer Floor Drains

Provide with double drainage flange, perforated or slotted cast bronze, polished stainless steel, or chromium-plated copper alloy strainer, and adjustable collar. Drains of sizes 50, 80, and 100 mm 2, 3, and 4 inches shall have strainers with minimum free drainage area of 3225, 7100, 11,610 square mm 5, 11, and 18 square inches, respectively.

2.4.4.2 Shower Floor Drains

Provide as specified for flush strainer floor drains, except that finish shall be polished stainless steel or chromium-plated copper alloy. PVC drains may be provided for plastic shower stalls.

2.4.4.3 Extended Rim Floor Drains

Provide as specified for flush strainer floor drains, except strainer body shall have 25 mm one inch extended rim installed flush with finished floor.

2.4.4.4 Roof Drains

ANSI A112.21.2M; provide hot-dip galvanized cast-iron or ductile-iron drains, with minimum of 250 mm 10 inch diameter body, nonpuncturing flashing clamp device with integral gravel stop and deck clamp, and removable cast-iron or ductile-iron or polypropylene locking dome. Free area of dome shall be not less than two times the free area of drain outlet. Provide drain flashing ring seat flush with adjacent roof deck, and secure rigidly in place with deck clamp.

2.4.4.5 Floor Sinks

Provide cast-iron body with white acid-resisting porcelain enameled or epoxy interior, double drainage flange, nickel bronze rim and slotted grate, removable stainless steel or aluminum slotted buckets, and P-trap.

2.4.5 Grease Interceptors (Traps)

PDI G 101.

2.4.6 Oil Interceptors

Provide cast iron or welded steel, coated inside and outside with white acid resistant epoxy, with internal air relief bypass, bronze cleanout plug, double wall trap seal, removable combination pressure equalizing and flow diffusing baffle and sediment bucket, horizontal baffle, adjustable oil draw-off and vent connections on either side, gas and watertight gasketed nonskid cover, and flow control fitting.

2.4.7 Acid Resistant DWV Pipe, Fittings, and Couplings

Provide ASTM A 518/A 518M, silicon-iron composition, DWV pipe, fittings, and couplings of the mechanical or bell and spigot type joints for buried piping and aboveground piping. Provide cleanouts and drains as specified for DWV piping, except material shall be silicon-iron composition. ASTM D 2665, PVC plastic pipe, fittings, and solvent cement may be provided for buried piping and aboveground piping except for medical facilities; do not use PVC plastic piping above ground in more than 2 story buildings.

2.5 DOMESTIC WATER PIPING

2.5.1 Soldered Joint Copper Tubing

Provide ASTM B 88M ASTM B 88, Type L or M for aboveground piping, Type K for buried piping, with ANSI B16.18 or ASME/ANSI B16.22 solder joint fittings, unions, and flanges; provide adapters as required. Provide ASTM B 42 copper pipe nipples with threaded end connections. Provide ASTM B 32, 95-5 tin-antimony solder, or provide Plumbing Code approved lead-free solder.

2.5.2 CPVC Plastic Pipe, Fittings, and Solvent Cement

ASTM D 2846/D 2846M, may be provided for sizes 50 mm 2 inches and smaller. Provide transition union connections or threaded gate valve between copper tubing and chlorinated polyvinyl chloride (CPVC) piping. Provide male threaded adapters with Teflon pipe thread paste for threaded connections to valves, strainers, and equipment. [Provide CPVC piping for salt water flushing system.]

2.5.3 Water Valves

Provide valves suitable for minimum of 860 kPa (gage) 125 psig and minimum of 82 degrees C 180 degrees F hot water. Valves shall have flanged end connections, except sizes smaller than 65 mm 2.5 inches may have threaded end connections with a union on all but one side of the valve. Ball valves may be provided in lieu of gate valves. Provide blue finish and red finish on handwheels for valves in cold domestic water piping and hot domestic water piping, respectively.

2.5.3.1 Gate Valves

MSS SP-80, Class 125, except sizes 65 mm 2.5 inches and larger shall conform to MSS SP-70, Class 125.

2.5.3.2 Globe and Angle Valves

MSS SP-80, Class 125, except sizes 65 mm 2.5 inches and larger shall conform to MSS SP-85, Class 125.

2.5.3.3 Check Valves

MSS SP-80, Class 125, swing check, except sizes 65 mm 2.5 inches and larger shall conform to MSS SP-71, Class 125.

2.5.3.4 Ball Valves

Full port design, copper alloy, except sizes 65 mm 2.5 inches and larger shall be ductile-iron body or cast-iron body. Valves shall have two-position lever handles.

2.5.3.5 Hose Bibbs

Provide angle type copper alloy hose bibb with removable handwheel. Inlet shall have internal threads. Outlet shall have vacuum breaker with 20 mm 0.75 inch external hose threads.

2.5.3.6 Nonfreeze Wall Hydrant

ASSE 1019, with lockshield and removable handwheel. Inlet shall have internal threads. Outlet shall have automatic draining vacuum breaker with 20 mm 0.75 inch external hose threads. Hydrant shall be of sufficient length to extend through walls and place the valve seat inside the building or in the crawl space. Bonnet and valve stem shall be removable from outside of the building.

2.5.3.7 Combination Pressure and Temperature Relief Valves

ANSI Z21.22 copper alloy body, automatic reseating, test lever, and discharge capacity based on AGA temperature steam rating.

2.5.3.8 Pressure Relief Valves

ANSI Z21.22 copper alloy body, automatic reseating with test lever.

2.5.3.9 Water Temperature Regulating Valves

Provide copper alloy or cast-iron body valve with adjustable range to allow settings between 43 and 71 degrees C 110 and 160 degrees F.

2.5.3.10 Water Temperature Mixing Valves

Provide copper alloy or cast-iron body valve of the pressure equalizing type. Valve shall be of the adjustable thermostatic type and shall mix the hot water and cold water to deliver hot water at set temperature.

2.5.3.11 Water Pressure Reducing Valves

ASSE 1003.

2.5.4 Piping Accessories

2.5.4.1 Strainers

Strainers shall have blow off outlet with pipe nipple and gate valve and discharge pipe nipple. Copper alloy or cast-iron body. Provide stainless steel strainer element with perforations of 1.20 mm 0.047 inch.

2.5.4.2 Pressure Gages

Provide single style pressure gage for water with 120 mm 4.5 inch dial, brass or aluminum case, bronze tube, gage cock, pressure snubber, and syphon. Provide scale range suitable for the intended service.

2.5.4.3 Thermometers

Provide bi-metal dial type thermometers with stainless steel case, stem, and fixed thread connection; 125 mm 5 inch diameter dial with glass face gasketed within the case; accuracy within 2 percent of scale range. Provide scale range suitable for the intended service.

2.5.4.4 Valve Boxes

For each buried valve provide cast-iron, ductile-iron, or plastic box of a suitable size. Provide cast-iron, ductile-iron, or plastic cover for the box with the word "WATER" cast on the cover. Plastic boxes shall be constructed of ABS plastic or inorganic fiber-reinforced black polyolefin plastic. Coat cast-iron and ductile-iron boxes with bituminous paint.

2.5.4.5 Backflow Prevention Assemblies

Provide reduced pressure principle type backflow prevention assemblies which are approved by and has a current "Certificate of Approval" from the FCCCHR-USC. Listing of the particular make, model/design, and size in the current FCCCHR-USC will be acceptable as the required proof.

2.5.4.6 Water Meters

AWWA C701, turbine type, with register reading in liters U.S. gallons.

2.5.4.7 Water Hammer Arresters

PDI WH 201.

2.6 WATER PRESSURE BOOSTER SYSTEM

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NOTE: One of the following systems will be used to boost the water pressure to the value required for service within the building. Indicate location, sizes, horsepower, and capacities of equipment on drawings. Provide duplex pumps, if discharge capacity is greater than 1.6 liter per second (25 gpm) and total head is at least 59.78 kPa (20 feet).

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2.6.1 Constant Speed Pumping System

Constant speed pumping system with pressure-regulating valves shall employ one lead pump for low flows, and one or more lag pumps for higher flows. Pressure-regulating valves shall be provided with nonslam check feature. The factory prepiped and prewired assembly shall be mounted on a steel frame, complete with pumps, motors, and automatic controls. The system capacity and capacity of individual pumps shall be as indicated. Current sensing relays shall provide staging of the pumps. The pumps shall be protected from thermal buildup, when running at no-flow, by a common thermal relief valve. Pressure gauges shall be mounted on the suction and discharge headers. The control panel shall bear the UL listing label for industrial control panels and shall be in a NEMA 250, Type 1 enclosure. The control panel shall include the following: No-flow shutdown; 7-day time clock; audiovisual alarm; external resets; manual alternation; magnetic motor controllers; time delays; transformer; current relays; "HAND-OFF-AUTOMATIC" switches for each pump; minimum run timers; low suction pressure cutout; and indicating lights for power on, individual motor overload, and low suction pressure. The control circuit shall be interlocked so that the failure of any controller shall energize the succeeding controller.

2.6.2 Hydro-Pneumatic Water Pressure System

An ASME code constructed tank stamped for 862 kPa (125 psig) 125 psig water working pressure shall be provided. The tank shall have a flexible diaphragm made of material conforming to FDA requirements for use with potable water and shall be factory precharged to meet required system pressure.

2.6.3 Variable Speed Pumping System

Variable speed pumping system shall provide system pressure by varying speed and number of operating pumps. The factory prepiped and prewired assembly shall be mounted on a steel frame complete with pumps, variable speed drives, motors, and controls. The variable speed drives shall be the oil-filled type capable of power transmission throughout their complete speed range without vibration, noise, or shock loading. Each variable speed drive shall be run-tested by the manufacturer for rated performance, and the manufacturer shall furnish written performance certification. System shall have suppressors to prevent noise transmission over electric feed lines. Required electrical control circuitry and system function sensors shall be supplied by the variable speed drive manufacturer. The primary power controls and magnetic motor controllers shall be installed in [the controls supplied by the drive manufacturer] [the motor control center]. The sensors shall be located in the system to control drive speed as a function of [constant pump discharge pressure] [constant system pressure at location indicated]. Connection between the sensors and the variable speed drive controls shall be accomplished with [hydraulic sensing lines] [copper wiring] [telemetry]. Controls shall be in NEMA 250, Type 1 enclosures.

2.7 MISCELLANEOUS PIPING ITEMS

2.7.1 Escutcheon Plates

Provide one piece or split hinge metal plates for piping entering floors, walls, and ceilings in exposed spaces. Provide chromium-plated or polished stainless steel finish on copper alloy plates in finished spaces. Provide paint finish on plates in unfinished spaces.

2.7.2 Pipe Sleeves

Provide where piping passes entirely through walls, ceilings, roofs, and floors. Secure sleeves in position and location during construction. Provide sleeves of sufficient length to pass through entire thickness of walls, ceilings, roofs, and floors. Provide 25 mm one inch minimum clearance between exterior of piping or pipe insulation, and interior of sleeve or core-drilled hole. Firmly pack space with mineral wool insulation. Seal space at both ends of sleeve or core-drilled hole with plastic waterproof cement which will dry to a firm but pliable mass, or provide a mechanically adjustable segmented elastomeric seal. In fire walls and fire floors, seal both ends of sleeves or core-drilled holes with UL listed fill, void, or cavity material.

2.7.2.1 Sleeves in Masonry and Concrete

Provide steel pipe sleeves or schedule 40 PVC plastic pipe sleeves. Sleeves are not required where drain, waste, and vent (DWV) piping passes through concrete floor slabs located on grade. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

2.7.3 Sleeves Not in Masonry and Concrete

Provide 26 gage galvanized steel sheet or PVC plastic pipe sleeves.

2.7.4 Pipe Hangers (Supports)

Provide MSS SP-58 and MSS SP-69, Type 1 with adjustable type steel support

rods, except as specified or indicated otherwise. Attach to steel joists with Type 19 or 23 clamps and retaining straps. Attach to Steel W or S beams with Type 21, 28, 29, or 30 clamps. Attach to steel angles and vertical web steel channels with Type 20 clamp with beam clamp channel adapter. Attach to horizontal web steel channel and wood with drilled hole on centerline and double nut and washer. Attach to concrete with Type 18 insert or drilled expansion anchor. Provide Type 40 insulation protection shield for insulated piping.

2.7.5 Nameplates

Provide 3.2 mm 0.125 inch thick melamine laminated plastic nameplates, black matte finish with white center core, for equipment, gages, thermometers, and valves; valves in supplies to faucets will not require nameplates. Accurately align lettering and engrave minimum of 6.4 mm 0.25 inch high normal block lettering into the white core. Minimum size of nameplates shall be 25 by 63 mm 1.0 by 2.5 inches. Key nameplates to a chart and schedule for each system. Frame charts and schedules under glass and place where directed near each system. Furnish two copies of each chart and schedule.

PART 3 EXECUTION

3.1 INSTALLATION

Installation of plumbing systems including fixtures, equipment, materials, workmanship, fabrication, assembly, erection, examination, inspection, and testing shall be in accordance with the Plumbing Code, ANSI A40, and in accordance with the manufacturer's recommendations. Provide wye strainer on building side of water supply valve in each building; provide wye strainer blow-off outlet with piping to adjacent exterior wall hydrant.

3.1.1 Threaded Connections

Jointing compound for pipe threads shall be Teflon pipe thread paste; apply only on male threads. Do not thread metal pipe into plastic piping.

3.1.2 Pipe Hangers (Supports)

Provide additional pipe hangers at the concentrated loads in piping, such as for inline water pumps and flanged valves.

3.1.2.1 Piping to Receive Insulation

Provide temporary wood spacers between the insulation protection shield and the pipe in order to properly slope the piping and to establish final elevations. Temporary wood spacers shall be of the same thickness as the insulation to be provided under Section 15080, "Mechanical Insulation."

3.1.2.2 Maximum Spacing in Vertical Piping

Support metal piping at each floor, but at not more than 3 meters 10 foot intervals, with pipe riser clamps or offset pipe clamps. Support plastic piping at each floor and at midpoint between floors, but at not more than 1.50 meters 5 foot intervals.

3.1.2.3 Maximum Spacing in Horizontal Piping

Support cast-iron piping at 1.50 meters 5 foot intervals, except for pipe

exceeding 1.50 meters 5 foot length, provide hangers at intervals equal to the pipe length but not exceeding 3 meters 10 feet. Support plastic piping at 1.22 meters 4 foot intervals and at each change of direction. Support copper tubing as follows:

MAXIMUM SPACING (METERS)

Nominal Pipe Size (mm)	25 and under	32	40	50	65	80	90	100	125	150
Copper Tube	1.75	2	2.50	2.50	2.75	3	3.25	3.62	4	4.25

MAXIMUM SPACING (FEET)

Nominal Pipe Size (inches)	One and under	1.25	1.5	2	2.5	3	3.5	4	5	6
Copper Tube	6	7	8	8	9	10	11	12	13	14

3.1.3 Copper Tube Extracted Joint

An extracted mechanical tee joint may be made in copper tube. Make joint with an appropriate tool by drilling a pilot hole and drawing out the tube surface to form a collar having a minimum height of three times the thickness of the tube wall. To prevent the branch tube from being inserted beyond the depth of the extracted joint, provide dimpled depth stops. Notch the branch tube for proper penetration into fitting to ensure a free flow joint. Braze extracted joints using a copper phosphorus classification brazing filler metal. Soldered joints shall not be permitted.

3.2 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS

Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure. Bolt sleeves around mains; bolt AWWA gate valve to the branch. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service. Notify the Contracting Officer in writing at least 15 days prior to the date the connections are required; receive approval before any service is interrupted. Provide materials required to make connections into the existing water supply systems and perform excavating, backfilling, and other incidental labor as required. Furnish the labor and the tapping or drilling machine for making the actual connections to the existing systems.

3.3 FIELD QUALITY CONTROL

3.3.1 Field Testing

Before final acceptance of the work, test each system as in service to demonstrate compliance with the contract requirements. Perform the following tests in addition to the tests specified in the Plumbing Code, except as modified herein. Correct defects in the work provided by the Contractor, and repeat tests until work is in compliance with contract requirements. Furnish water, electricity, instruments, connecting devices, and personnel for performing tests.

3.3.1.1 Domestic Water Piping

Before applying insulation, hydrostatically test each piping system at not less than 827 kPa-gage 120 psig with no leakage or reduction in gage pressure for 2 hours.

3.3.1.2 DWV Piping

Before the installation of fixtures, cap ends of each system, fill piping with water to the roof, and allow to stand until a thorough inspection has been made. If the system is tested in sections, each opening shall be plugged and each section tested with not less than a 3 meters 10 foot head of water. After plumbing fixtures have been set and their traps filled with water, subject the entire sanitary system to a final air pressure test of not more than 25.4 mm 1.0 inch of water column and a smoke or peppermint test. Perform the air and smoke test with an approved smoke testing machine which shall show a clear passage of smoke and air throughout the entire system. The entire system shall be proven absolutely tight under such test.

3.3.2 Inspections

Prior to initial operation, inspect piping system for compliance with drawings, specifications, and manufacturer's submittals.

3.4 DISINFECTION

Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C651. Fill piping systems with solution containing minimum of 50 parts per million of available chlorine and allow solution to stand for minimum of 24 hours. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 to 0.5 parts per million, or the residual chlorine content of domestic water supply. Obtain at least two consecutive satisfactory bacteriological samples from new water piping, analyze by a certified laboratory, and submit the results prior to the new water piping being placed into service. Disinfection of systems supplied by nonportable water is not required.

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NOTE: For Iceland projects only, include the following option.
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3.5 [OPTIONAL DISINFECTION METHOD

Disinfect new potable water piping and affected portions of existing potable water piping with geothermal water. Geothermal water shall be not less than 90 degrees C 194 degrees F and contact time shall be not less than 30 minutes. After disinfection, thoroughly flush new portable water piping and affected portions of existing potable water piping with the chlorinated base water supply for a minimum of two hours.]

-- End of Section --